

US 18023

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of: **Ilya E. Nifant'Ev et al.**

Serial Number: **Unknown**

Filed: **August 27, 2001**

US National Phase of International Patent
Application No: **PCT/EP00/13191**

Filed: **December 22, 2000**

For: **HETEROCYCLIC METALLOCENE
COMPOUNDS AND USE THEREOF IN
CATALYST SYSTEMS FOR PRODUCING
OLEFIN POLYMERS**

Commissioner for Patents
Box Patent Application
Washington, D.C. 20231

August 27, 2001

PRELIMINARY AMENDMENT

This is a preliminary amendment to US 18023, filed herewith, which is the US National Phase of the International Patent Application No. PCT/EP00/13191, filed on December 22, 2000, and claiming priority to European Patent Application 99204567.4 filed on December 28, 1999.

In the Specification

Please replace the paragraph beginning at page 28, line 3 and ending at line 9, with the following paragraph:

--The catalysts of the present invention can also be supported on an inert carrier. This is achieved by depositing the metallocene compound (A) or the product of the reaction thereof

with the component (B), or the component (B) and then the metallocene compound (A) on supports such as, for example, silica, alumina, magnesium halides, styrene/divinylbenzene copolymers, polyethylene or polypropylene. The supportation process is carried out in an inert solvent such as hydrocarbon for example toluene, hexane, pentane or propane and at a temperature ranging from 0°C to 100°C, preferably the process is carried out at room temperature.--

Please replace the paragraph beginning at page 31, line 11 and ending at line 15 with the following paragraph.

--The microstructures of polypropylene obtained by the process of the present invention, cover a range of commercial copolymers such as elastomeric, flexible, and random-like polypropylene, but with the difference that the melting point of the polypropylene of the present invention is always higher than the cited copolymer. Thus polypropylene of the present invention can easily replace these more expensive copolymers. --

Please replace the paragraph beginning at page 37, line 11 and ending at page 38, line 2 with the following paragraph:

--A 2.5 M solution of *n*-BuLi in hexane (21.30 mL, 53.25 mmol) was added dropwise at -50°C to a solution of 8.99 g of 3,3'-dibromo-2,2'-dithienylmethane obtained as described above (Mw = 338.09, 26.59 mmol) in 75 mL of ether under nitrogen atmosphere in a 250 mL flask. After 1 h stirring at -50°C, the dark brown dilithium suspension was added slowly to a suspension of 7.26 g of CuCl₂ (Aldrich, 98%, Mw = 134.45, 52.92 mmol) in 50 mL of Et₂O. The reaction mixture was kept at -50°C for 30 min, allowed to warm to -20°C in 2 h 30 min and then allowed to reach 0°C in few minutes. Aliquots were taken after 30 min at -50°C, at -20°C and after 1 h at 0°C to follow the reaction state by GC-MS analysis. It appeared that the CuCl₂ induced coupling reaction starts at -50°C but proceeds slowly until 0°C. Only 10wt% of 7H-

cyclopenta[2,1-b:4,3-b']dithiophene was formed after 1 h at 0°C. After keeping at 0°C for 1 h 30 min, the reaction mixture was stirred overnight at room temperature and subsequently poured at 0°C into 100 mL of an aqueous 2 M HCl solution. The resulting mixture was stirred for 15 min at room temperature, filtered in order to remove the greyish precipitate of Cu₂Cl₂, the ether layer was separated and the aqueous phase extracted with ether. The combined ethereal extracts were washed with HCl 2 M (100 mL), twice with NaHCO₃ aq. and finally with ether. The resulting organic phase (final volume = 300 mL) was dried with Na₂SO₄ and the solvents removed in vacuo giving 3.16 g of a dark red oil, which was analysed by GC-MS analysis and ¹H-NMR spectroscopy. The analysis showed the presence of the desired product together with dimers, trimers and tars. The crude product was added of 40 mL of ethanol and stirred for 1 h at room temperature. The yellow-orange extract was concentrated in vacuo at 55°C for 4 h to give a dark orange oil (1.92 g), which crystallized by standing at 0°C overnight.--

Please replace the paragraph beginning at page 44, line 5, and ending at line 12 with the following paragraph:

--A 1.6 M solution of *n*-BuLi (164 mL, 0.26 mol) was added at -70°C to a stirred solution of 44.26 g of 2-methyl-4-bromo-thiophene (0.25 mol) in 300 mL of ether. The resulting solution was kept under stirring at -60°C to -70°C for 30 min and then was treated with 27.4 g of dimethylformamide (0.37 mol) in 100 mL of ether. The mixture was allowed to warm to room temperature, then neutralized with 10% aqueous solution of NH₄Cl, washed with 10% aqueous solution of H₃PO₄ and finally with water up to neutral pH. The organic phase was collected, evaporated off and distilled at 110°C/10mmHg. Yield 22.3 g (71%). The title compound was characterized by ¹H-NMR spectroscopy.--

Please replace the paragraph beginning at page 44, line 16, and ending at line 22 with the following paragraph:

--113 mL of 1.6 M *n*-BuLi solution (0.18 mol) was added to a solution of 31.3 g of 2-methyl-4-bromo-thiophene (0.177 mol) in 150 mL of ether at -70°C under stirring. The resulting solution was kept under stirring at -60 to -70°C for 30 min and then was added of 22.3 g of 2-methyl-4-formyl-thiophene (0.177 mol) in 100 mL of ether. The mixture was allowed to warm to room temperature, then neutralized with 10% aqueous solution of NH₄Cl and washed with water. The organic phase was separated and evaporated. The crude bis(2-methyl-4-thienyl)methanol (or 2,2'-dimethyl-4,4'-dithienyl carbinol) was obtained.--

Please replace the paragraph beginning at page 44, line 23, and ending at page 45, line 2 with the following paragraph:

--A suspension of 35.5 g of AlCl₃ (0.266 mol) in 100 mL of ether was added slowly to a suspension of 10 g of LiAlH₄ (0.266 mol) in 100 mL of ether. The resulting mixture was treated with the solution of the carbinol (obtained as described above) in 100 mL ether. The reaction mixture was refluxed for additional 1 h, cooled to room temperature and subsequently added of 100 mL of ethyl acetate. Then it was treated with 300 mL of water and 300 mL of ether. The organic phase was collected, washed with water, dried by MgSO₄ and evaporated off. The residue was distilled at 90 to 110°C/0.5 mmHg. Yield 23.2 g (63%). The title compound was characterized by ¹H-NMR spectroscopy.--

In the Claims

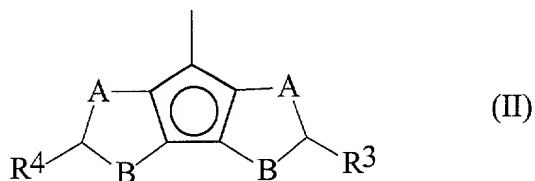
Please amend claims 1-25, 27, and 29-32 to read as follows:

--1. (Amended) A metallocene compound of general formula (I):



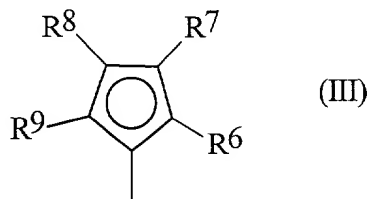
wherein

L is a divalent group bridging the moieties G and Z, selected from CR^1R^2 , SiR^1R^2 or $(\text{CR}^1\text{R}^2)_2$, wherein R^1 and R^2 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom, which can form a ring having 3 to 8 atoms optionally bearing a substituent;
Z is a moiety of formula (II):



wherein

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom;
A and B are sulfur (S), oxygen (O) or CR^5 , wherein R^5 is hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR^5 or if B is S or O, then A is CR^5 , and wherein the rings containing A and B have a double bond in the allowed position;
G is a moiety of formula (III):



wherein

R^6 , R^7 , R^8 and R^9 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R^6 and R^7 , and R^8 and R^9 can form a ring comprising from 3 to 8

atoms, optionally bearing substituents, with the proviso that R^7 is different from R^8 and when R^7 is a tert-butyl radical, R^8 is not hydrogen;

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements,

X, which may be the same or different, is a hydrogen atom, halogen atom, a group R^{10} , OR^{10} , OSO_2CF_3 , $OCOR^{10}$, SR^{10} , NR^{10}_2 or PR^{10}_2 , wherein the substituents R^{10} are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl,

C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms;

p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2;

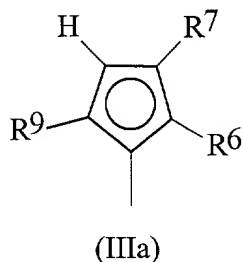
with the proviso that said metallocene compound is different from:

isopropylidene (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-ethylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-ethylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-n-butylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-n-butylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-methylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-methylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-isopropylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride and dimethylsilanediyl (3-isopropylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride.

2. (Amended) The metallocene according to claim 1, wherein the transition metal M is selected from titanium, zirconium or hafnium.
3. (Amended) The metallocene according to claim 1, wherein L is CMe_2 or $SiMe_2$.
4. (Amended) The metallocene according to claim 1, wherein A or B is a sulfur atom and the other is a CH group.
5. (Amended) The metallocene according to claim 1, wherein R^3 and R^4 are the same

and are a C₁-C₂₀-alkyl group, which can contain a silicon atom.

6. (Amended) The metallocene according to claim 1, wherein G is a moiety of formula (IIIa):



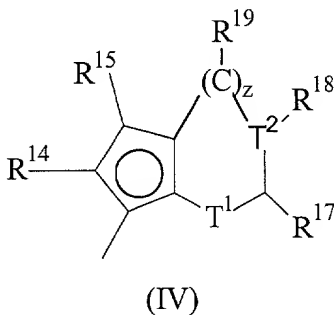
wherein

R⁶ and R⁹ equal to or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements;

R⁷ is a C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or a QR¹¹R¹²R¹³ group, wherein Q is C, Si, or Ge;

R¹¹, R¹² and R¹³, which may be the same as or different from each other, are hydrogen, C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radicals, optionally containing a heteroatom, with the proviso that when Q is a carbon atom, at least one of R¹¹, R¹² and R¹³ is a hydrogen atom.

7. (Amended) The metallocene according to claim 6, wherein R⁷ is a phenyl, a CHR¹¹R¹² or a SiR¹¹R¹²R¹³ group, wherein R¹¹, R¹² and R¹³ are hydrogen or C₁-C₂₀-alkyl groups.
8. (Amended) The metallocene according to claim 1, wherein G is a moiety of formula (IV):



wherein

T¹ is a sulfur atom or a CR¹⁶ group;

T² is a carbon atom or a nitrogen atom;

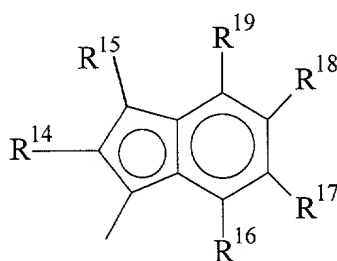
z is 1 or 0;

the ring containing T¹ and T² has double bonds in the allowed position;

with the proviso that if z is 1, T¹ is a CR¹⁶ group and T² is a carbon atom and the ring formed is a benzene ring; and if z is 0, T² bonds directly the cyclopentadienyl ring, the 5 membered ring formed has double bond in any of the allowed positions having an aromatic character and T¹ and T² are not at the same time, a sulfur atom and a nitrogen atom.

R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸ and R¹⁹, same or different, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, any of two adjacent R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸ and R¹⁹ can form a ring comprising 4 to 8 atoms optionally bearing substituents.

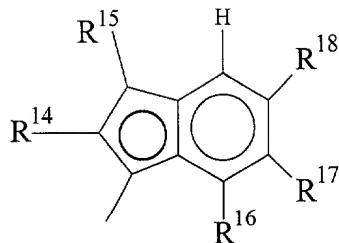
9. (Amended) The metallocene according to claim 8, wherein G is a moiety of formula (IVa):



(IVa)

wherein R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸ and R¹⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms, and any of two adjacent R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸ and R¹⁹ can form a ring comprising 4 to 8 atoms optionally bearing substituents and the benzene ring optionally being perhydrated.

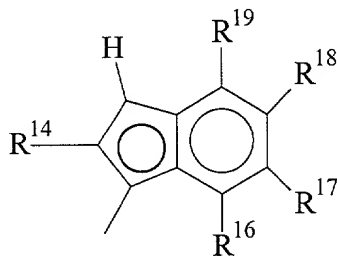
10. (Amended) The metallocene according to claim 9, wherein G is a moiety of formula (IVb)



(IVb)

wherein R^{15} , R^{16} , R^{17} , and R^{18} are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and any of two adjacent R^{15} , R^{16} , R^{17} , R^{18} can form a ring comprising 4 to 8 atoms optionally bearing substituents; R^{14} being a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl group.

11. (Amended) The metallocene according to claim 9, wherein G is a moiety of formula (IVc)



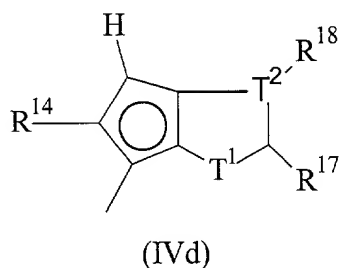
(IVc)

wherein R^{14} , R^{16} , R^{17} , and R^{18} are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and optionally any of two adjacent R^{16} , R^{17} , and R^{18} can form a ring comprising 4 to 8 atoms optionally bearing substituents;

R^{19} is a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl group or forms with R^{18} a benzene ring optionally bearing substituents.

12. (Amended) The metallocene according to claim 11, wherein R^{14} is a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl group.
13. (Amended) The metallocene according to claim 11, wherein R^{16} is a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl.

14. (Amended) The metallocene according to claim 8, wherein G is a moiety of formula (IVd):



wherein

T¹ is a sulfur atom or a CR¹⁶ group;

T² is a carbon atom or a nitrogen atom;

the 5 member ring formed by T¹ and T² has double bonds in any of the allowed positions, having an aromatic character;

with the proviso that if T¹ is a sulphur atom T² is not a nitrogen atom;

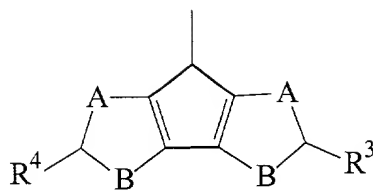
R¹⁴, R¹⁷ and R¹⁸ which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements and R¹⁷ and R¹⁸ can form a ring comprising 4 to 8 atoms optionally bearing substituents.

15. (Amended) The metallocene according to claim 14 wherein T² is a carbon atom; T¹ is a sulphur atom and R¹⁴, R¹⁷ and R¹⁸ equal to or different from each other are a C₁-C₂₀-alkyl, or C₆-C₂₀-aryl.
16. (Amended) A ligand of formula (V):



wherein L is a divalent group bridging the moieties G and Z, selected from CR¹R², SiR¹R² or (CR¹R²)₂, wherein R¹ and R², which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z' is a moiety of formula (VI):



(VI)

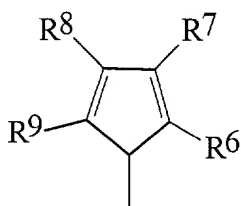
or its double bond isomers;

wherein the double bonds are in any of the allowed positions;

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR^5 , wherein R^5 is hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR^5 or if B is S or O, then A is CR^5 , and wherein the rings containing A and B have a double bond in the allowed position;

G' is a moiety of formula (VII):



(VII)

or its double bond isomers;

wherein

R^6 , R^7 , R^8 and R^9 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R^6 and R^7 , and R^8 and R^9 can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with

the proviso that R^7 is different from R^8 and when R^7 is a tert-butyl radical, R^8 is not hydrogen.

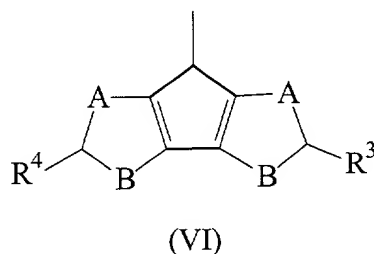
17. (Amended) A process for the preparation of a ligand of formula (V):



wherein

L is a divalent group bridging the moieties G and Z, selected from CR^1R^2 , SiR^1R^2 or $(CR^1R^2)_2$, wherein R^1 and R^2 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z' is a moiety of formula (VI):



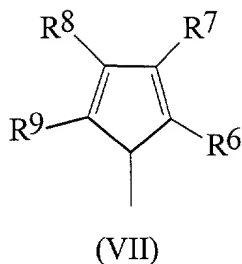
or its double bond isomers;

wherein the double bonds are in any of the allowed positions;

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR^5 , wherein R^5 is hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR^5 or if B is S or O, then A is CR^5 , and wherein the rings containing A and B have a double bond in the allowed position;

G' is a moiety of formula (VII):



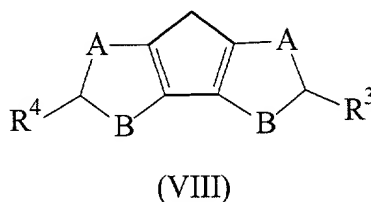
or its double bond isomers;

wherein

R^6 , R^7 , R^8 and R^9 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R^6 and R^7 , and R^8 and R^9 can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with the proviso that R^7 is different from R^8 and when R^7 is a tert-butyl radical, R^8 is not hydrogen;

comprising the following steps:

- a) contacting a compound of the formula (VIII) with a base selected from the group consisting of metallic sodium and potassium, sodium and potassium hydroxide and an organic lithium compound, wherein the molar ratio between the compound of the formula (VIII) and said base is at least 1:1;

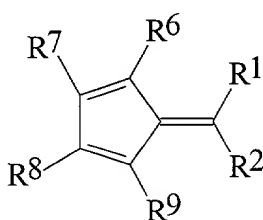


wherein

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR⁵, wherein R⁵ is hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR⁵ or if B is S or O, then A is CR⁵, and wherein the rings containing A and B have a double bond in the allowed position;

- b) contacting the obtained anionic compounds of the formula (VIII) from step a) with a compound of formula (IX):



(IX)

wherein

R¹ and R², which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with the proviso that R⁷ is different from R⁸ and when R⁷ is a tert-butyl radical, R⁸ is not hydrogen; and then

- (c) treating the obtained product from step b) with a protonating agent.

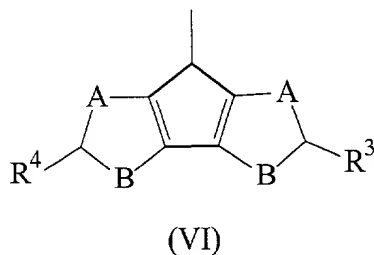
18. (Amended) A process for the preparation of a ligand of formula (V):



wherein

L is a divalent group bridging the moieties G and Z, selected from CR^1R^2 , SiR^1R^2 or $(\text{CR}^1\text{R}^2)_2$, wherein R^1 and R^2 , which may be the same as or different from each other, are hydrogen, a $\text{C}_1\text{-C}_{20}$ -alkyl, $\text{C}_3\text{-C}_{20}$ -cycloalkyl, $\text{C}_2\text{-C}_{20}$ -alkenyl, $\text{C}_6\text{-C}_{20}$ -aryl, $\text{C}_7\text{-C}_{20}$ -alkylaryl, or $\text{C}_7\text{-C}_{20}$ -arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z' is a moiety of formula (VI):



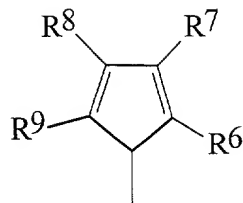
or its double bond isomers;

wherein the double bonds are in any of the allowed positions;

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a $\text{C}_1\text{-C}_{20}$ -alkyl, $\text{C}_3\text{-C}_{20}$ -cycloalkyl, $\text{C}_2\text{-C}_{20}$ -alkenyl, $\text{C}_6\text{-C}_{20}$ -aryl, $\text{C}_7\text{-C}_{20}$ -alkylaryl, or $\text{C}_7\text{-C}_{20}$ -arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR^5 , wherein R^5 is hydrogen, a $\text{C}_1\text{-C}_{20}$ -alkyl, $\text{C}_3\text{-C}_{20}$ -cycloalkyl, $\text{C}_2\text{-C}_{20}$ -alkenyl, $\text{C}_6\text{-C}_{20}$ -aryl, $\text{C}_7\text{-C}_{20}$ -alkylaryl, or $\text{C}_7\text{-C}_{20}$ -arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR^5 or if B is S or O, then A is CR^5 , and wherein the rings containing A and B have a double bond in the allowed position;

G' is a moiety of formula (VII):



(VII)

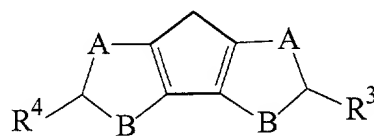
or its double bond isomers;

wherein

R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with the proviso that R⁷ is different from R⁸ and when R⁷ is a tert-butyl radical, R⁸ is not hydrogen;

comprising the following steps:

- a) contacting a compound of the formula (VIII) with a base selected from the group consisting of metallic sodium and potassium, sodium and potassium hydroxide and an organic lithium compound, wherein the molar ratio between the compound of the formula (VIII) and said base is at least 1:1



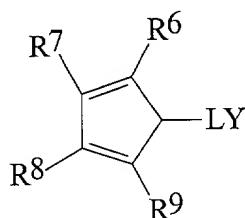
(VIII)

wherein

R³ and R⁴, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom; A and B are sulfur (S), oxygen (O) or CR⁵, wherein R⁵ is hydrogen, a C₁-C₂₀-alkyl,

C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR⁵ or if B is S or O, then A is CR⁵, and wherein the rings containing A and B have a double bond in the allowed position;

- b) contacting the obtained anionic compounds from step a) with a compound of formula (IX):



(IX)

wherein Y is a halogen radical selected from the group consisting of chloride, bromide and iodide;

L is a divalent group bridging the moieties G and Z, selected from CR¹R², SiR¹R² or (CR¹R²)₂, wherein R¹ and R², which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with the proviso that R⁷ is different from R⁸ and when R⁷ is a tert-butyl radical, R⁸ is not hydrogen.

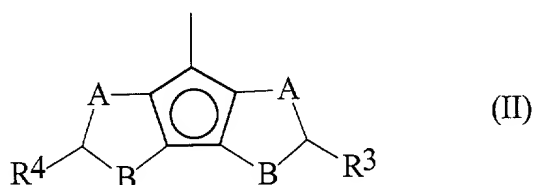
19. (Amended) A process for the preparation of a metallocene compound of general formula (I):



wherein

L is a divalent group bridging the moieties G and Z, selected from CR^1R^2 , SiR^1R^2 or $(\text{CR}^1\text{R}^2)_2$, wherein R^1 and R^2 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z is a moiety of formula (II):

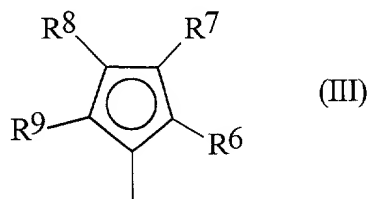


wherein

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR^5 , wherein R^5 is hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR^5 or if B is S or O, then A is CR^5 , and wherein the rings containing A and B have a double bond in the allowed position;

G is a moiety of formula (III):



wherein

R^6 , R^7 , R^8 and R^9 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl,

C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with the proviso that R⁷ is different from R⁸ and when R⁷ is a tert-butyl radical, R⁸ is not hydrogen;

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements,

X, which may be the same or different, is a hydrogen atom, halogen atom, a group R¹⁰, OR¹⁰, OSO₂CF₃, OCOR¹⁰, SR¹⁰, NR¹⁰₂ or PR¹⁰₂, wherein the substituents R¹⁰ are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms;

p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2; with the proviso that said metallocene compound is different from:

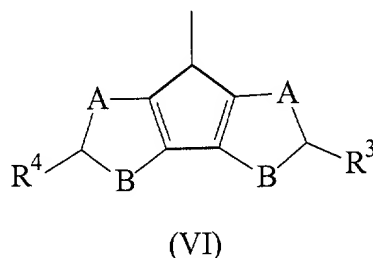
isopropylidene (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-ethylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-ethylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-n-butylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-n-butylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-methylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-methylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-i-propylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride and dimethylsilanediyl (3-i-propylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride;

said process comprising contacting the ligand of general formula (V)



wherein L is a divalent group bridging the moieties G and Z, selected from CR^1R^2 , SiR^1R^2 or $(CR^1R^2)_2$, wherein R^1 and R^2 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z' is a moiety of formula (VI):



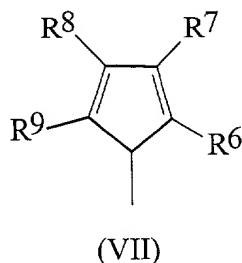
or its double bond isomers;

wherein the double bonds are in any of the allowed positions;

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR^5 , wherein R^5 is hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR^5 or if B is S or O, then A is CR^5 , and wherein the rings containing A and B have a double bond in the allowed position;

G' is a moiety of formula (VII):



or its double bond isomers;

wherein R^6 , R^7 , R^8 and R^9 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R^6 and R^7 , and R^8 and R^9 being capable of forming a ring comprising from 3 to 8 atoms, optionally having substituents, with the proviso that R^7 is different from R^8 and when R^7 is a tert-butyl radical, R^8 is not hydrogen;

with a base capable of forming a corresponding dianionic compound and thereafter with a compound of general formula MX_{p+2} , wherein

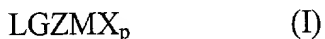
M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements,

X, which may be the same or different, is a hydrogen atom, halogen atom, a group R^{10} , OR^{10} , OSO_2CF_3 , $OCOR^{10}$, SR^{10} , NR^{10}_2 or PR^{10}_2 , wherein the substituents R^{10} are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms; and

p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2.

20. (Amended) A catalyst obtained by contacting:

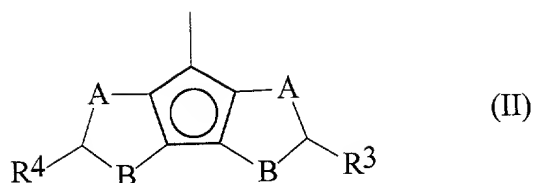
(A) a metallocene compound of formula (I)



wherein

L is a divalent group bridging the moieties G and Z, selected from CR^1R^2 , SiR^1R^2 or $(CR^1R^2)_2$, wherein R^1 and R^2 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z is a moiety of formula (II):



wherein

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR^5 , wherein R^5 is hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR^5 or if B is S or O, then A is CR^5 , and wherein the rings containing A and B have a double bond in the allowed position;

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements,

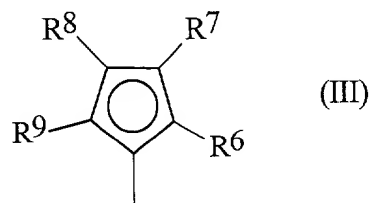
X, which may be the same or different, is a hydrogen atom, halogen atom, a group R^{10} , OR^{10} , OSO_2CF_3 , $OCOR^{10}$, SR^{10} , NR^{10}_2 or PR^{10}_2 , wherein the substituents R^{10} are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms;

p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2;

with the proviso that said metallocene compound is different from:

isopropylidene (3-trimethylsilylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, dimethylsilanediyl (3-trimethylsilylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, isopropylidene (3-ethylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, dimethylsilanediyl (3-ethylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, isopropylidene (3-n-butylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, dimethylsilanediyl (3-n-butylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, isopropylidene (3-methylcyclopentadienyl)(7-

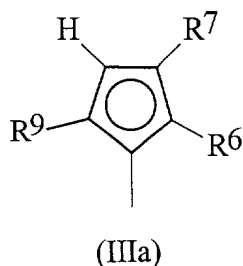
cyclopentadiene)zirconium dichloride, dimethylsilanediyl (3-methylcyclopentadienyl)(7-cyclopentadiene)zirconium dichloride, isopropylidene (3-i-propylcyclopentadienyl)(7-cyclopentadiene)zirconium dichloride and dimethylsilanediyl (3-i-propylcyclopentadienyl)(7-cyclopentadiene)zirconium dichloride;
 and G is a moiety of formula (III):



wherein R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents; with the proviso that R⁷ is different from R⁸ and when R⁷ is a tertbutyl radical R⁸ is not hydrogen; and

(B) at least one of an alumoxane and a compound capable of forming an alkyl metallocene.

21. (Amended) The catalyst according to claim 20 wherein in the metallocene compound of formula (I) G is a moiety of formula (IIIa)

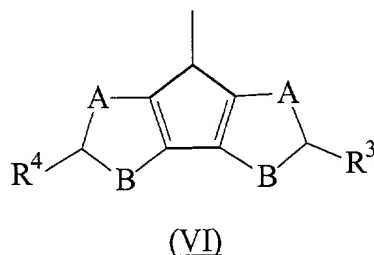


wherein

R⁶ and R⁹ equal to or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical,

hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z' is a moiety of formula (VI):



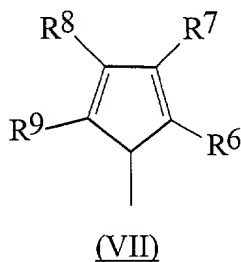
or its double bond isomers;

wherein the double bonds are in any of the allowed positions;

R³ and R⁴, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR⁵, wherein R⁵ is hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR⁵ or if B is S or O, then A is CR⁵, and wherein the rings containing A and B have a double bond in the allowed position;

G' is a moiety of formula (VII):



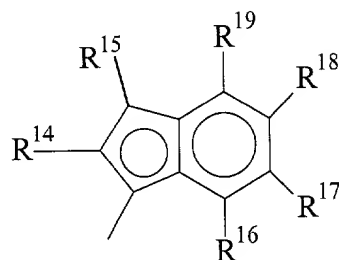
or its double bond isomers;

wherein

R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen,

8 atoms optionally bearing substituents.

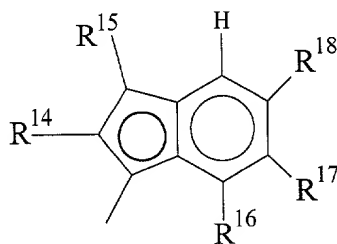
22. (Amended) The catalyst according to claim 21 wherein in the metallocene compound of formula (I) G is a moiety selected from the compound of formula (IVa),



(IVa)

wherein R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸ and R¹⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms, and any of two adjacent R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸ and R¹⁹ can form a ring comprising 4 to 8 atoms optionally bearing substituents and the benzene ring optionally being perhydrated,

formula (IVb),

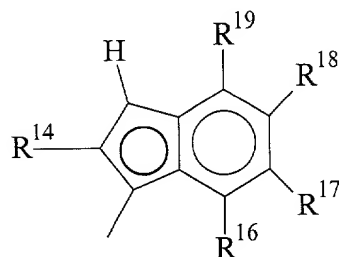


(IVb)

wherein R¹⁵, R¹⁶, R¹⁷, and R¹⁸ are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements,

and any of two adjacent R^{14} , R^{15} , R^{16} , R^{17} , R^{18} can form a ring comprising 4 to 8 atoms optionally bearing substituents; R^{14} being a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl group,

formula (IVc),

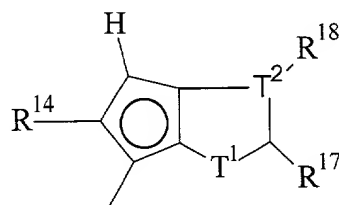


(IVc)

wherein R^{14} , R^{16} , R^{17} , and R^{18} are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and optionally any of two adjacent R^{14} , R^{16} , R^{17} , R^{18} and R^{19} can form a ring comprising 4 to 8 atoms optionally bearing substituents;

R^{19} is a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl group or forms with R^{18} a benzene ring optionally having substituents.

or formula (IVd)



(IVd)

wherein

T^1 is a sulfur atom or a CR^{16} group;

T^2 is a carbon atom or a nitrogen atom;

the 5 member ring formed by T¹ and T² has double bonds in any of the allowed positions, having an aromatic character;

with the proviso that if T¹ is a sulphur atom T² is not a nitrogen atom;

R¹⁴, R¹⁷ and R¹⁸ which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements and R¹⁷ and R¹⁸ can form a ring comprising 4 to 8 atoms optionally bearing substituents.

23. (Amended) The catalyst according to claim 20, wherein said alumoxane is selected from methylalumoxane (MAO), isobutylalumoxane (TIBAO) or 2,4,4-trimethyl-pentylalumoxane (TIOAO).
24. (Amended) The catalyst according to claim 20, wherein the compound capable of forming a metallocene alkyl cation is a compound of formula D⁺E⁻, wherein D⁺ is a Brønsted acid, able to donate a proton and to react irreversibly with a substituent X of the metallocene of formula (I) and E⁻ is a compatible anion, which is able to stabilize the active catalytic species originating from the reaction of the two compounds, and which is sufficiently labile to be able to be removed by an olefinic monomer.
25. (Amended) A process for the preparation of a polymer of alpha-olefins comprising contacting one or more alpha-olefins under polymerization conditions with a catalyst obtained by contacting:

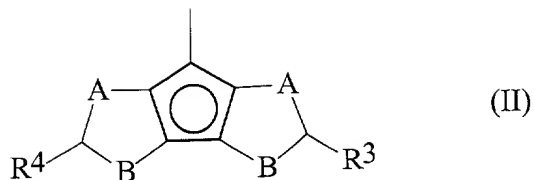
(A) a metallocene compound of formula (I)



wherein

L is a divalent group bridging the moieties G and Z, selected from CR¹R², SiR¹R² or (CR¹R²)₂, wherein R¹ and R², which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z is a moiety of formula (II):



wherein

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR^5 , wherein R^5 is hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR^5 or if B is S or O, then A is CR^5 , and wherein the rings containing A and B have a double bond in the allowed position;

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements,

X, which may be the same or different, is a hydrogen atom, halogen atom, a group R^{10} , OR^{10} , OSO_2CF_3 , $OCOR^{10}$, SR^{10} , NR^{10}_2 or PR^{10}_2 , wherein the substituents R^{10} are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms;

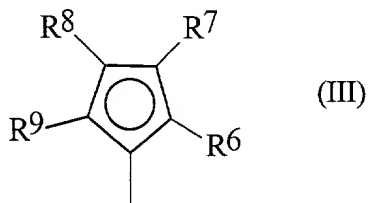
p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2;

with the proviso that said metallocene compound is different from:

isopropylidene (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-ethylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-ethylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-n-butylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-n-butylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-methylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride,

dimethylsilanediyl (3-methylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, isopropylidene (3-i-propylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride and dimethylsilanediyl (3-i-propylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride;

and G is a moiety of formula (III):



wherein R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents; with the proviso that R⁷ is different from R⁸ and when R⁷ is a tertbutyl radical R⁸ is not hydrogen; and

(B) at least one of an alumoxane and a compound capable of forming an alkyl metallocene.

27. (Amended) The process according to claim 26 wherein the process is carried out in the presence of an alpha-olefin selected from 1-butene, 1-pentene, 1-hexene, 4-methyl-1-pentene, 1-octene, 1-decene or 1-dodecene.
29. (Amended) The process according to claim 28, wherein the process is carried out in the presence of an olefin selected from propylene, 1-butene, 1-pentene, 4-methyl-1-pentene, 1-hexene, 1-octene, 4,6-dimethyl-1-heptene, 1-decene, 1-dodecene, 1-tetradecene, 1-hexadecene, 1-octadecene, 1-eicosene, allylcyclohexane, cyclopentene, cyclohexene and norbornene, 1,5-hexadiene, 1-6-heptadiene, 2-methyl-1,5-hexadiene, trans 1,4-hexadiene, cis 1,4-hexadiene, 6-methyl-1,5-heptadiene, 3,7-dimethyl-1,6-octadiene, 11-methyl-1,10-dodecadiene, or 5-ethylidene-2-norbornene.
30. (Amended) The process according to claim 25 wherein the catalyst is supported on

an inert carrier.

31. (Amended) The process according to claim 25 characterized in that it is carried out in gas phase.
32. (Amended) A propylene homopolymer having the following characteristics:
 - triads (mm) satisfy the relation $55 < \text{mm} < 85$;
 - melting enthalpy (ΔH) of between 5 J/g and 70 J/g.
 - Haze (ASTM 2457) from 15% to 30%;
 - Gloss (60°C) (ASTM 2457) from 60% to 95%;
 - Tensile modulus (ASTM D4065) from 1000 MPa to 200 MPa;
 - Elongation at break (ASTM D4065) from 300% to 900%;
 - Strength at break (ASTM D638) from 10% to 40%. --

REMARKS

This preliminary amendment is being filed concurrently with Applicants' application US 18023, for which a serial number has not yet been assigned. Typographical errors in the specification have been corrected, and claims 1-25, 27, and 29-32 have been amended to better point out and more specifically claim the present invention. No new matter has been added by these amendments and they do not affect the scope of the claims as originally filed.

Separate pages with a marked-up version of the amended specification and claims entitled: "Version with Markings to Show Changes Made" are attached.

An early and favorable action on the merits is requested. The Applicants invite the Examiner to direct any questions or comments to the undersigned at the telephone number given below.

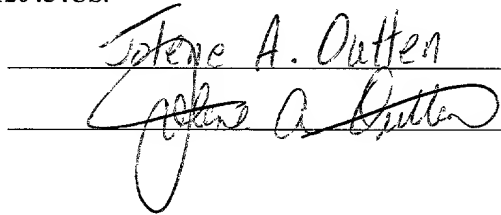
It is not believed that any fee is required for entry and consideration of this Amendment; nevertheless, the Commissioner is hereby authorized to charge U.S. PTO Deposit Account 08-2336 in the amount of any such required fee.

Respectfully submitted,



William R. Reid
Registration No. 47,894
Attorney for Applicant

I hereby certify that this correspondence is being deposited with the United States Postal Service as "**Express Mail Post Office to Addressee**" in an envelope addressed to: Box PCT, Commissioner for Patents, Washington, DC 20231 on August 27, 2001 with the number of the Express Mail label being **EK794120454US**.



Enclosure
Basell USA Inc.
912 Appleton Road
Elkton, MD 21921
Attorney's Telephone No.: 410-996-1783

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Filed on August 27, 2001

In the Specification

Paragraph beginning at page 28, line 3 and ending at line 9.

The catalysts of the present invention can also be supported on an inert carrier. This is achieved by depositing the metallocene compound (A) or the product of the reaction thereof with the component (B), or the component (B) and then the metallocene compound (A) on supports such as, for example, silica, alumina, magnesium halides, styrene/divinylbenzene copolymers, polyethylene or polypropylene. The supportation process is carried out in an inert solvent such as hydrocarbon for example toluene, hexane, pentane or propane and at a temperature [rangeing]ranging from 0°C to 100°C, preferably the process is carried out at room temperature.

Paragraph beginning at page 31, line 11 and ending at line 15.

The microstructures of [polypropilene]polypropylene obtained by the process of the present invention, cover a range of commercial copolymers such as elastomeric, flexible, and random-like polypropylene, but with the difference that the melting point of the polypropylene of the present invention is always higher than the cited copolymer. Thus polypropylene of the present invention can easily replace these more expensive copolymers.

Paragraph beginning at page 37, line 11 and ending at page 38, line 2.

A 2.5 M solution of *n*-BuLi in hexane (21.30 mL, 53.25 mmol) was added dropwise at -50°C to a solution of 8.99 g of 3,3'-dibromo-2,2'-dithienylmethane obtained as described above (Mw = 338.09, 26.59 mmol) in 75 mL of ether under nitrogen atmosphere in a 250 mL flask. After 1 h stirring at -50°C, the dark brown dilithium suspension was added slowly to a suspension of 7.26 g of CuCl₂ (Aldrich, 98%, Mw = 134.45, 52.92 mmol) in 50 mL of Et₂O. The reaction mixture was kept at -50°C for 30 min, allowed to warm to -20°C in 2 h 30 min and then allowed to reach 0°C in few minutes. Aliquots were taken after 30 min at -50°C, at -20°C and after 1 h at 0°C to follow the reaction state by GC-MS analysis. It appeared that the

CuCl₂ induced coupling reaction starts at -50°C but proceeds slowly until 0°C. Only 10wt% of 7H-cyclopenta[2,1-b:4,3-b']dithiophene was formed after 1 h at 0°C. After keeping at 0°C for 1 h 30 min, the reaction mixture was stirred overnight at room temperature and subsequently poured at 0°C into 100 mL of an aqueous 2 M HCl solution. The resulting mixture was stirred for 15 min at room temperature, filtered in order to remove the [greysh]greyish precipitate of Cu₂Cl₂, the ether layer was separated and the aqueous phase extracted with ether. The combined ethereal extracts were washed with HCl 2 M (100 mL), twice with NaHCO₃ aq. and finally with ether. The resulting organic phase (final volume = 300 mL) was dried with Na₂SO₄ and the solvents removed in vacuo giving 3.16 g of a dark red oil, which was analysed by GC-MS analysis and ¹H-NMR spectroscopy. The analysis showed the presence of the desired product together with dimers, trimers and tars. The crude product was added of 40 mL of ethanol and stirred for 1 h at room temperature. The yellow-orange extract was concentrated in vacuo at 55°C for 4 h to give a dark orange oil (1.92 g), which crystallized by standing at 0°C overnight.

Paragraph beginning at page 44, line 5, and ending at line 12.

A 1.6 M solution of *n*-BuLi (164 mL, 0.26 mol) was added at -70°C to a stirred solution of 44.26 g of 2-methyl-4-bromo-thiophene (0.25 mol) in 300 mL of ether. The resulting solution was kept under stirring at -60°C [÷]to -70°C for 30 min and then was treated with 27.4 g of dimethylformamide (0.37 mol) in 100 mL of ether. The mixture was allowed to warm to room temperature, then neutralized with 10% aqueous solution of NH₄Cl, washed with 10% aqueous solution of H₃PO₄ and finally with water up to neutral pH. The organic phase was collected, evaporated off and distilled at 110°C/10mmHg. Yield 22.3 g (71%). The title compound was characterized by ¹H-NMR spectroscopy.

Paragraph beginning at page 44, line 16, and ending at line 22.

113 mL of 1.6 M *n*-BuLi solution (0.18 mol) was added to a solution of 31.3 g of 2-methyl-4-bromo-thiophene (0.177 mol) in 150 mL of ether at -70°C under stirring. The resulting solution was kept under stirring at -60 [÷]to -70°C for 30 min and then was added of 22.3 g of 2-methyl-4-formyl-thiophene (0.177 mol) in 100 mL of ether. The mixture was allowed to

warm to room temperature, then neutralized with 10% aqueous solution of NH_4Cl and washed with water. The organic phase was separated and evaporated. The crude bis(2-methyl-4-thienyl)methanol (or 2,2'-dimethyl-4,4'-dithienyl carbinol) was obtained.

Paragraph beginning at page 44, line 23, and ending at page 45, line 2.

A suspension of 35.5 g of AlCl_3 (0.266 mol) in 100 mL of ether was added slowly to a suspension of 10 g of LiAlH_4 (0.266 mol) in 100 mL of ether. The resulting mixture was treated with the solution of the carbinol (obtained as described above) in 100 mL ether. The reaction mixture was refluxed for additional 1 h, cooled to room temperature and subsequently added of 100 mL of ethyl acetate. Then it was treated with 300 mL of water and 300 mL of ether. The organic phase was collected, washed with water, dried by MgSO_4 and evaporated off. The residue was distilled at $90[+]$ to $110^\circ\text{C}/0.5$ mmHg. Yield 23.2 g (63%). The title compound was characterized by $^1\text{H-NMR}$ spectroscopy.

In the Claims

Claims 1-25, 27, and 29-32 have been changed by deleting the characters in brackets and adding the underlined material, as reported below. For the Examiner's convenience, even the unchanged claims have been reported in the following.

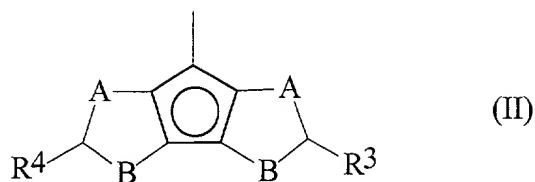
1. (Amended) A metallocene compound of general formula (I):



wherein

L is a divalent group bridging the moieties G and Z, selected from CR^1R^2 , SiR^1R^2 [and]or $(\text{CR}^1\text{R}^2)_2$, wherein R^1 and R^2 , which may be the same as or different from each other, are [selected from]hydrogen, a $\text{C}_1\text{-C}_{20}$ -alkyl, $\text{C}_3\text{-C}_{20}$ -cycloalkyl, $\text{C}_2\text{-C}_{20}$ -alkenyl, $\text{C}_6\text{-C}_{20}$ -aryl, $\text{C}_7\text{-C}_{20}$ -alkylaryl, or $\text{C}_7\text{-C}_{20}$ -arylalkyl radical, optionally containing a heteroatom, which can form a ring having 3 to 8 atoms [which can bear]optionally bearing a substituent;

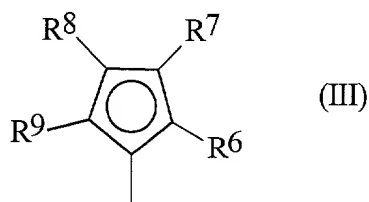
Z is a moiety of formula (II):



wherein

R^3 and R^4 , which may be the same as or different from each other, are [selected from]hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom; A and B are [selected from]sulfur (S), oxygen (O) or CR^5 , wherein R^5 is [selected from]hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR^5 or if B is S or O, then A is CR^5 , and wherein the rings containing A and B have a double bond in the allowed position;

G is a moiety of formula (III):



wherein

R^6 , R^7 , R^8 and R^9 , which may be the same as or different from each other, are [selected from]hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally [containing]containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R^6 and R^7 [and/or], and R^8 and R^9 can form a ring comprising from 3 to 8 atoms, [which can bear]optionally bearing substituents, with the proviso that R^7 is different from R^8 and when R^7 is a tert-butyl radical, R^8 is not hydrogen; M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements[(new IUPAC version)], X, which may be the same or different, is [selected from] a hydrogen atom, halogen atom, a group R^{10} , OR^{10} , OSO_2CF_3 , $OCOR^{10}$, SR^{10} , NR^{10}_2 or PR^{10}_2 , wherein the

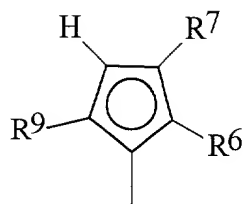
substituents R¹⁰ are [selected from]hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms;

p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2;

with the proviso that said metallocene compound is different from:

isopropylidene (3-trimethylsilylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, dimethylsilanediyl (3-trimethylsilylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, isopropylidene (3-ethylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, dimethylsilanediyl (3-ethylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, isopropylidene (3-n-butylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, dimethylsilanediyl (3-n-butylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, isopropylidene (3-methylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, dimethylsilanediyl (3-methylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, isopropylidene (3-i-propylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride and dimethylsilanediyl (3-i-propylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride[being excluded].

2. (Amended) The metallocene according to claim 1, wherein the transition metal M is selected from titanium, zirconium [and]or hafnium.
3. (Amended) The metallocene according to [any of claims]claim 1[to 2], wherein L is CMe₂ or SiMe₂.
4. (Amended) The metallocene according to [any of claims]claim 1[to 3], wherein A or B is a sulfur atom and the other is a CH group.
5. (Amended) The metallocene according to [any of claims]claim 1[to 4], wherein R³ and R⁴ are the same and are [selected from]a C₁-C₂₀-alkyl group, which can contain a silicon atom.
6. (Amended) The metallocene according to [any of claims]claim 1[to 5], wherein G is a moiety of formula (IIIa):



(IIIa)

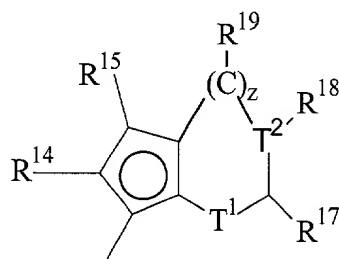
wherein

R^6 and R^9 equal to or different from each other, are [selected from]hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements;

R^7 is [selected from]a C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or a $QR^{11}R^{12}R^{13}$ group, wherein Q is [selected from]C, Si, or Ge;

R^{11} , R^{12} and R^{13} , which may be the same as or different from each other, are hydrogen, C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radicals, optionally containing a heteroatom, with the proviso that when Q is a carbon atom, at least one of R^{11} , R^{12} and R^{13} is a hydrogen atom.

7. (Amended) The metallocene according to claim 6, wherein R^7 is [selected from]a phenyl, a $CHR^{11}R^{12}$ [and]or a $SiR^{11}R^{12}R^{13}$ group, wherein R^{11} , R^{12} and R^{13} are hydrogen or C_1 - C_{20} -alkyl groups.
8. (Amended) The metallocene according to [any of claims]claim 1[to 5], wherein G is a moiety of formula (IV):



(IV)

wherein

T^1 is a sulfur atom or a CR^{16} group;

T^2 is a carbon atom or a nitrogen atom;

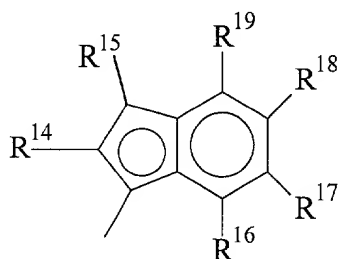
z is 1 or 0;

the ring containing T^1 and T^2 has double bonds in the allowed position;

with the proviso that if z is 1, T^1 is a CR^{16} group and T^2 is a carbon atom and the ring formed is a benzene ring; and if z is 0, T^2 bonds directly the cyclopentadienyl ring, the 5 membered ring formed has double bond in any of the allowed [position]positions having an aromatic character and T^1 and T^2 are not at the same time, a sulfur atom and a nitrogen atom.

R^{14} , R^{15} , R^{16} , R^{17} , R^{18} and R^{19} , same or different, are [selected from]hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, any of two adjacent R^{14} , R^{15} , R^{16} , R^{17} , R^{18} and R^{19} can form a ring comprising 4 to 8 atoms [which can bear]optionally bearing substituents.

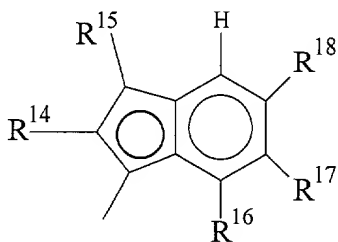
9. (Amended) The metallocene according to claim 8, wherein G is a moiety of formula [(IVb)](IVa):



(IVa)

wherein R^{14} , R^{15} , R^{16} , R^{17} , R^{18} and R^{19} , which may be the same as or different from each other, are [selected from]hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms, and any of two adjacent R^{14} , R^{15} , R^{16} , R^{17} , R^{18} and R^{19} can form a ring comprising 4 to 8 atoms [which can bear]optionally bearing substituents and the benzene ring [can be]optionally being perhydrated.

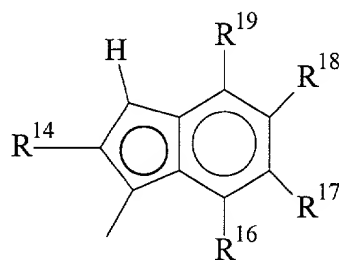
10. (Amended) The metallocene according to claim 9, wherein G is a moiety of formula (IVb)



(IVb)

wherein R^{15} , R^{16} , R^{17} , and R^{18} are [selected from]hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and any of two adjacent [R^{14} , R^{15} , R^{16} , R^{17} , R^{18}] can form a ring comprising 4 to 8 atoms [which can bear]optionally bearing substituents; R^{14} [is selected from the group consisting of] being a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl group.

11. (Amended) The metallocene according to claim 9, wherein G is a moiety of formula (IVc)

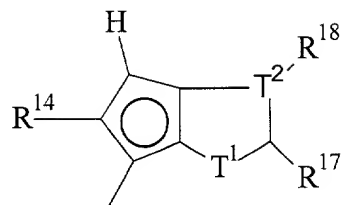


(IVc)

wherein R^{14} , R^{16} , R^{17} , and R^{18} are [selected from]hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and optionally any of two adjacent [R^{14} , R^{16} , R^{17} , and R^{18}] [and R^{19}] can form a ring comprising 4 to 8 atoms [which can bear]optionally bearing substituents;[;]

R^{19} is [selected from the group consisting of]a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl group or forms with R^{18} a benzene ring [that can bears]optionally bearing substituents.

12. (Amended) The metallocene according to claim 11, wherein R^{14} is [selected from the group consisting of]a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl group[such as a methyl, ethyl, or phenyl group].
13. (Amended) The metallocene according to [any of claima 11-12]claim 11, wherein R^{16} is [selected from the group consisting of]a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl.
14. (Amended) The metallocene according to claim 8, wherein G is a moiety of formula (IVd):



(IVd)

wherein

T¹ is a sulfur atom or a CR¹⁶ group;

T² is a carbon atom or a nitrogen atom;

the 5 member ring formed by T¹ and T² has double bonds in any of the allowed [position]positions, having an aromatic character;

with the proviso that if T¹ is a sulphur atom T² is not a nitrogen atom;

R¹⁴, R¹⁷ and R¹⁸ which may be the same as or different from each other, are [selected from]hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements and R¹⁷ and R¹⁸ can form a ring comprising 4 to 8 atoms [which can bear]optionally bearing substituents.

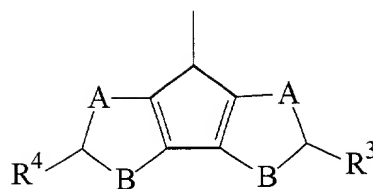
15. (Amended) The metallocene according to claim 14 wherein T² is a carbon atom; T¹ is a sulphur atom and R¹⁴, R¹⁷ and R¹⁸ equal to or different from each other are a C₁-C₂₀-alkyl, or C₆-C₂₀-aryl.

16. (Amended) A ligand of formula (V):



wherein L is [defined as in claims 1-5:] a divalent group bridging the moieties G and Z, selected from CR¹R², SiR¹R² or (CR¹R²)₂, wherein R¹ and R², which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z' is a moiety of formula (VI):



(VI)

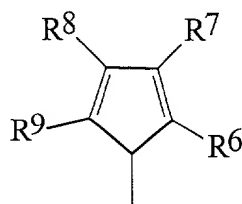
[and]or its double [bound]bond isomers;

wherein [A, B, R³ and R⁴ are defined as in claims 1-5 and]the double bonds are in any of the allowed positions;

R³ and R⁴, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR⁵, wherein R⁵ is hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR⁵ or if B is S or O, then A is CR⁵, and wherein the rings containing A and B have a double bond in the allowed position;

G' is a moiety of formula (VII):



(VII)

[and]or its double bond isomers;

wherein [R⁶, R⁷, R⁸ and R⁹ have the meaning as defined in any of claims 1 to 5]

R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with the proviso that R⁷ is different from R⁸ and when R⁷ is a tert-butyl radical, R⁸ is not hydrogen.

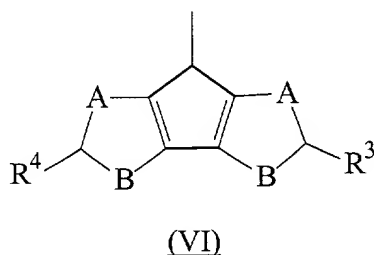
17. (Amended) A process for the preparation of a ligand of formula (V):



wherein [G', Z' and L are defined as in claim 16;]

L is a divalent group bridging the moieties G and Z, selected from CR¹R², SiR¹R² or (CR¹R²)₂, wherein R¹ and R², which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z' is a moiety of formula (VI):



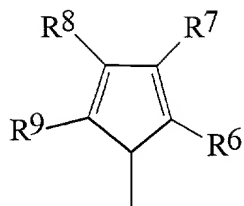
or its double bond isomers;

wherein the double bonds are in any of the allowed positions;

R³ and R⁴, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR⁵, wherein R⁵ is hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR⁵ or if B is S or O, then A is CR⁵, and wherein the rings containing A and B have a double bond in the allowed position;

G' is a moiety of formula (VII):



(VII)

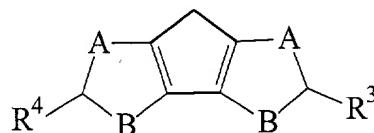
or its double bond isomers;

wherein

R^6 , R^7 , R^8 and R^9 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R^6 and R^7 , and R^8 and R^9 can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with the proviso that R^7 is different from R^8 and when R^7 is a tert-butyl radical, R^8 is not hydrogen;

comprising the following steps:

- a) contacting a compound of the formula (VIII) with a base selected from the group consisting of metallic sodium and potassium, sodium and potassium hydroxide and an organic lithium compound, wherein the molar ratio between the compound of the formula (VIII) and said base is at least 1:1;



(VIII)

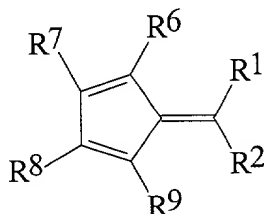
wherein [A, B, R^3 and R^4 are described in claims 1-5;]

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR^5 , wherein R^5 is hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR^5 or if B is S or O, then A is CR^5 , and wherein the rings containing A

and B have a double bond in the allowed position;

- b) contacting the [corresponding anionic moiety]obtained anionic compounds of the formula (VIII) from step a) with a compound of formula (IX):



(IX)

wherein [R¹, R², R⁶, R⁷, R⁸ and R⁹ are described in claim 1]

R¹ and R², which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with the proviso that R⁷ is different from R⁸ and when R⁷ is a tert-butyl radical, R⁸ is not hydrogen; and then

(c) treating the obtained product from step b) with a protonating agent.

18. (Amended) A process for the preparation of a ligand of formula (V):

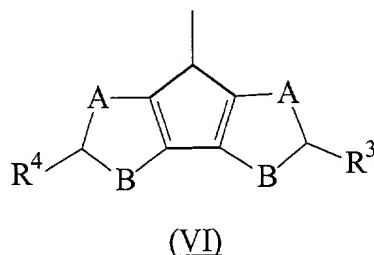


wherein [L, G' and Z' are defined as in claim 16 are defined in claim 1]

L is a divalent group bridging the moieties G and Z, selected from CR¹R², SiR¹R² or (CR¹R²)₂, wherein R¹ and R², which may be the same as or different from each other, are

hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z' is a moiety of formula (VI):



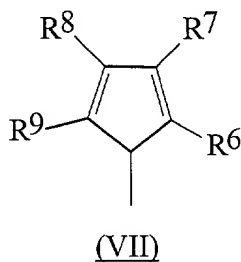
or its double bond isomers;

wherein the double bonds are in any of the allowed positions;

R³ and R⁴, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR⁵, wherein R⁵ is hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR⁵ or if B is S or O, then A is CR⁵, and wherein the rings containing A and B have a double bond in the allowed position;

G' is a moiety of formula (VII):



or its double bond isomers;

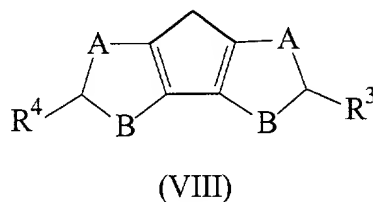
wherein

R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen,

a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with the proviso that R⁷ is different from R⁸ and when R⁷ is a tert-butyl radical, R⁸ is not hydrogen;

comprising the following steps:

- a) contacting a compound of the formula (VIII) with a base selected from the group consisting of metallic sodium and potassium, sodium and potassium hydroxide and an organic lithium compound, wherein the molar ratio between the compound of the formula (VIII) and said base is at least 1:1

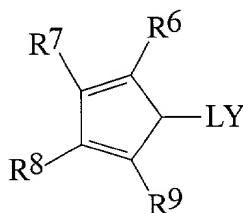


wherein [A, B, R³ and R⁴ are described as in claims 1-5;]

R³ and R⁴, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR⁵, wherein R⁵ is hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR⁵ or if B is S or O, then A is CR⁵, and wherein the rings containing A and B have a double bond in the allowed position;

- b) contacting the obtained anionic compounds [of the formula (VIII)]from step a) with a compound of formula (IX):



(IX)

wherein $[L, R^6, R^7, R^8 \text{ and } R^9]$ are defined as in claims 1-5 and $]Y$ is a halogen radical selected from the group consisting of chloride, bromide and iodide[.];

L is a divalent group bridging the moieties G and Z, selected from CR^1R^2 , SiR^1R^2 or $(CR^1R^2)_2$, wherein R^1 and R^2 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

R^6, R^7, R^8 and R^9 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R^6 and R^7 , and R^8 and R^9 can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with the proviso that R^7 is different from R^8 and when R^7 is a tert-butyl radical, R^8 is not hydrogen.

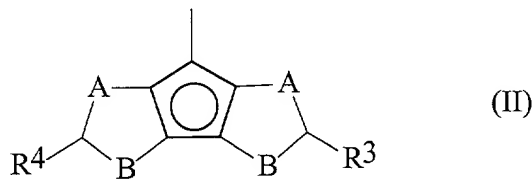
19. (Amended) A process for the preparation of a metallocene compound [as defined in any of claims 1 to 15, obtainable by] of general formula (I):



wherein

L is a divalent group bridging the moieties G and Z, selected from CR^1R^2 , SiR^1R^2 or $(CR^1R^2)_2$, wherein R^1 and R^2 , which may be the same as or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z is a moiety of formula (II):



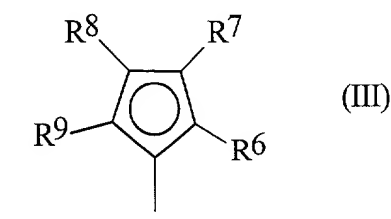
wherein

R^3 and R^4 , which may be the same as or different from each other, are hydrogen,

a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR⁵, wherein R⁵ is hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR⁵ or if B is S or O, then A is CR⁵, and wherein the rings containing A and B have a double bond in the allowed position;

G is a moiety of formula (III):



wherein

R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents, with the proviso that R⁷ is different from R⁸ and when R⁷ is a tert-butyl radical, R⁸ is not hydrogen;

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements,

X, which may be the same or different, is a hydrogen atom, halogen atom, a group R¹⁰, OR¹⁰, OSO₂CF₃, OCOR¹⁰, SR¹⁰, NR¹⁰₂ or PR¹⁰₂, wherein the substituents R¹⁰ are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms;

p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2; with the proviso that said metallocene compound is different from:

isopropylidene (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium

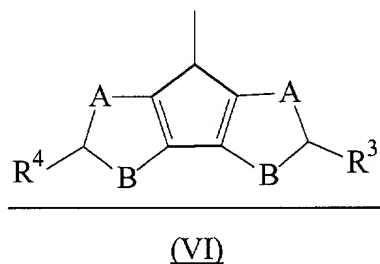
dichloride, isopropylidene (3-ethylcyclopentadienyl)(7-cyclopentadienyl)zirconium
dichloride, dimethylsilanediyl (3-ethylcyclopentadienyl)(7-cyclopentadienyl)zirconium
dichloride, isopropylidene (3-n-butylcyclopentadienyl)(7-cyclopentadienyl)zirconium
dichloride, dimethylsilanediyl (3-n-butylcyclopentadienyl)(7-cyclopentadienyl)zirconium
dichloride, isopropylidene (3-methylcyclopentadienyl)(7-cyclopentadienyl)zirconium
dichloride, dimethylsilanediyl (3-methylcyclopentadienyl)(7-cyclopentadienyl)zirconium
dichloride, isopropylidene (3-i-propylcyclopentadienyl)(7-cyclopentadienyl)zirconium
dichloride and dimethylsilanediyl (3-i-propylcyclopentadienyl)(7-
cyclopentadienyl)zirconium dichloride;

said process comprising contacting the ligand of general formula (V)



wherein L is a divalent group bridging the moieties G and Z, selected from CR^1R^2 , SiR^1R^2 or $(\text{CR}^1\text{R}^2)_2$, wherein R^1 and R^2 , which may be the same as or different from each other, are hydrogen, a $\text{C}_1\text{-C}_{20}$ -alkyl, $\text{C}_3\text{-C}_{20}$ -cycloalkyl, $\text{C}_2\text{-C}_{20}$ -alkenyl, $\text{C}_6\text{-C}_{20}$ -aryl, $\text{C}_7\text{-C}_{20}$ -alkylaryl, or $\text{C}_7\text{-C}_{20}$ -arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z' is a moiety of formula (VI):



or its double bond isomers;

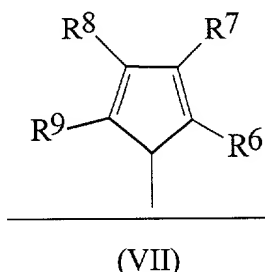
wherein the double bonds are in any of the allowed positions;

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a $\text{C}_1\text{-C}_{20}$ -alkyl, $\text{C}_3\text{-C}_{20}$ -cycloalkyl, $\text{C}_2\text{-C}_{20}$ -alkenyl, $\text{C}_6\text{-C}_{20}$ -aryl, $\text{C}_7\text{-C}_{20}$ -alkylaryl, or $\text{C}_7\text{-C}_{20}$ -arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR^5 , wherein R^5 is hydrogen, a $\text{C}_1\text{-C}_{20}$ -alkyl,

C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR⁵ or if B is S or O, then A is CR⁵, and wherein the rings containing A and B have a double bond in the allowed position;

G' is a moiety of formula (VII):



or its double bond isomers;

wherein R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ being capable of forming a ring comprising from 3 to 8 atoms, optionally having substituents, with the proviso that R⁷ is different from R⁸ and when R⁷ is a tert-butyl radical, R⁸ is not hydrogen;

with a base capable of forming [the]a corresponding dianionic compound and thereafter with a compound of general formula MX_{p+2}, wherein [M, X and p are defined as in claims 1-5]

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements.

X, which may be the same or different, is a hydrogen atom, halogen atom, a group R¹⁰, OR¹⁰, OSO₂CF₃, OCOR¹⁰, SR¹⁰, NR¹⁰₂ or PR¹⁰₂, wherein the substituents R¹⁰ are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms; and

p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2.

20. (Amended) A catalyst [obtainable]obtained by contacting:

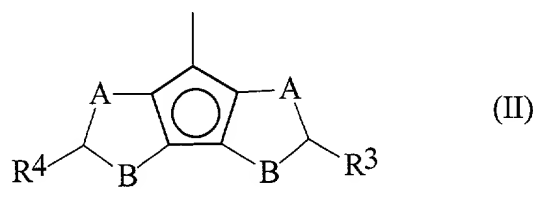
(A) a metallocene compound of formula (I)



wherein [L, Z, M, X, and p has been defined as in claims 1-5]

L is a divalent group bridging the moieties G and Z, selected from CR^1R^2 , SiR^1R^2 or $(\text{CR}^1\text{R}^2)_2$, wherein R^1 and R^2 , which may be the same as or different from each other, are hydrogen, a $\text{C}_1\text{-C}_{20}$ -alkyl, $\text{C}_3\text{-C}_{20}$ -cycloalkyl, $\text{C}_2\text{-C}_{20}$ -alkenyl, $\text{C}_6\text{-C}_{20}$ -aryl, $\text{C}_7\text{-C}_{20}$ -alkylaryl, or $\text{C}_7\text{-C}_{20}$ -arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8 atoms optionally bearing a substituent;

Z is a moiety of formula (II):



wherein

R^3 and R^4 , which may be the same as or different from each other, are hydrogen, a $\text{C}_1\text{-C}_{20}$ -alkyl, $\text{C}_3\text{-C}_{20}$ -cycloalkyl, $\text{C}_2\text{-C}_{20}$ -alkenyl, $\text{C}_6\text{-C}_{20}$ -aryl, $\text{C}_7\text{-C}_{20}$ -alkylaryl, or $\text{C}_7\text{-C}_{20}$ -arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR^5 , wherein R^5 is hydrogen, a $\text{C}_1\text{-C}_{20}$ -alkyl, $\text{C}_3\text{-C}_{20}$ -cycloalkyl, $\text{C}_2\text{-C}_{20}$ -alkenyl, $\text{C}_6\text{-C}_{20}$ -aryl, $\text{C}_7\text{-C}_{20}$ -alkylaryl, or $\text{C}_7\text{-C}_{20}$ -arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR^5 or if B is S or O, then A is CR^5 , and wherein the rings containing A and B have a double bond in the allowed position;

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements,

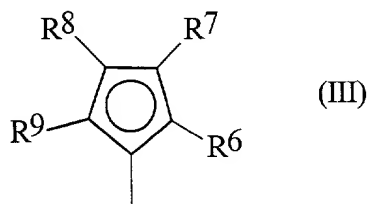
X, which may be the same or different, is a hydrogen atom, halogen atom, a group R^{10} , OR^{10} , OSO_2CF_3 , OCOR^{10} , SR^{10} , NR^{10}_2 or PR^{10}_2 , wherein the substituents R^{10} are hydrogen, a $\text{C}_1\text{-C}_{20}$ -alkyl, $\text{C}_3\text{-C}_{20}$ -cycloalkyl, $\text{C}_2\text{-C}_{20}$ -alkenyl, $\text{C}_6\text{-C}_{20}$ -aryl, $\text{C}_7\text{-C}_{20}$ -alkylaryl, or $\text{C}_7\text{-C}_{20}$ -arylalkyl radical, optionally containing heteroatoms;

p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2;

with the proviso that said metallocene compound is different from:

isopropylidene (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediy (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-

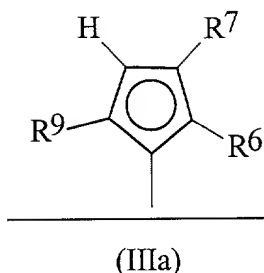
ethylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride,
dimethylsilanediyl (3-ethylcyclopentadienyl)(7-cyclopentaditiophene)zirconium
dichloride, isopropylidene (3-n-butylcyclopentadienyl)(7-
cyclopentaditiophene)zirconium dichloride, dimethylsilanediyl (3-n-
butylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride, isopropylidene
(3-methylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride,
dimethylsilanediyl (3-methylcyclopentadienyl)(7-cyclopentaditiophene)zirconium
dichloride, isopropylidene (3-i-propylcyclopentadienyl)(7-
cyclopentaditiophene)zirconium dichloride and dimethylsilanediyl (3-i-
propylcyclopentadienyl)(7-cyclopentaditiophene)zirconium dichloride;
and G is a moiety of formula (III):



wherein R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are [selected from the group consisting of]hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, at least one of substituent pairs R⁶ and R⁷ [and/or], and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, [which can bear]optionally bearing substituents; with the proviso that R⁷ is different from R⁸ and when R⁷ is a tertbutyl radical R⁸ is not hydrogen; and

(B) at least one of an alumoxane [and/or]and a compound capable of forming an alkyl metallocene.

21. (Amended) The catalyst according to claim 20 wherein in the metallocene compound of formula (I) G is a moiety of formula (IIIa)



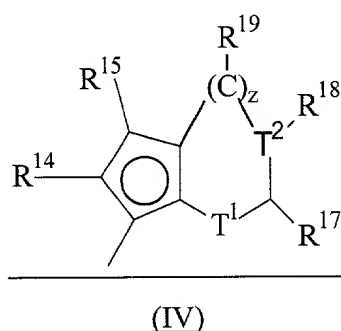
wherein

R^6 and R^9 equal to or different from each other, are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements

R^7 is a C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or a $QR^{11}R^{12}R^{13}$ group, wherein Q is C, Si, or Ge;

R^{11} , R^{12} and R^{13} , which may be the same as or different from each other, are hydrogen, C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radicals, optionally containing a heteroatom, with the proviso that when Q is a carbon atom, at least one of R^{11} , R^{12} and R^{13} is a hydrogen atom,

or formula (IV)



wherein

T^1 is a sulfur atom or a CR^{16} group;

T^2 is a carbon atom or a nitrogen atom;

z is 1 or 0;

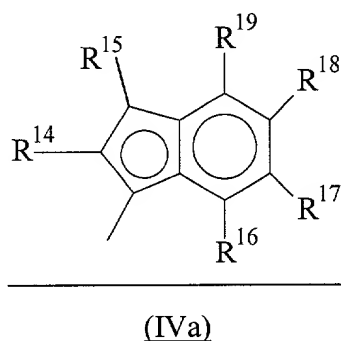
the ring containing T^1 and T^2 has double bonds in the allowed position;

with the proviso that if z is 1, T^1 is a CR^{16} group and T^2 is a carbon atom and the ring formed is a benzene ring; and if z is 0, T^2 bonds directly the cyclopentadienyl ring, the 5

membered ring formed has double bond in any of the allowed positions having an aromatic character and T¹ and T² are not at the same time, a sulfur atom and a nitrogen atom.

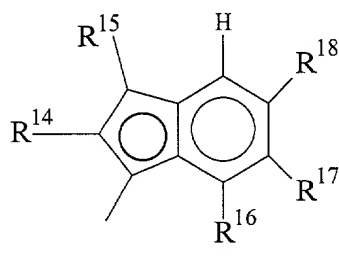
R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸ and R¹⁹, same or different, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, any of two adjacent R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸ and R¹⁹ can form a ring comprising 4 to 8 atoms optionally bearing substituents.

22. (Amended) The catalyst according to claim 21 wherein in the metallocene compound of formula (I) G is a moiety selected from the compound of formula (IVa),



wherein R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸ and R¹⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms, and any of two adjacent R¹⁴, R¹⁵, R¹⁶, R¹⁷, R¹⁸ and R¹⁹ can form a ring comprising 4 to 8 atoms optionally bearing substituents and the benzene ring optionally being perhydrated,

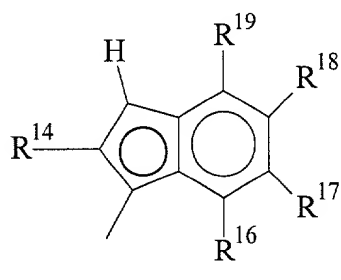
formula (IVb),



(IVb)

wherein R^{15} , R^{16} , R^{17} , and R^{18} are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and any of two adjacent R^{14} , R^{15} , R^{16} , R^{17} , R^{18} can form a ring comprising 4 to 8 atoms optionally bearing substituents; R^{14} being a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl group,

formula (IVc),

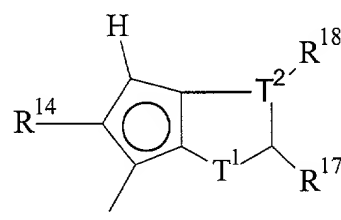


(IVc)

wherein R^{14} , R^{16} , R^{17} , and R^{18} are hydrogen, a C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl, or C_7 - C_{20} -arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and optionally any of two adjacent R^{14} , R^{16} , R^{17} , R^{18} and R^{19} can form a ring comprising 4 to 8 atoms optionally bearing substituents;

R^{19} is a C_1 - C_{20} -alkyl or C_6 - C_{20} -aryl group or forms with R^{18} a benzene ring optionally having substituents.

or formula (IVd)



(IVd)

wherein

T^1 is a sulfur atom or a CR^{16} group;

T² is a carbon atom or a nitrogen atom;
the 5 member ring formed by T¹ and T² has double bonds in any of the allowed
positions, having an aromatic character;
with the proviso that if T¹ is a sulphur atom T² is not a nitrogen atom;
R¹⁴, R¹⁷ and R¹⁸ which may be the same as or different from each other, are hydrogen, a
C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or
C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the
Periodic Table of the Elements and R¹⁷ and R¹⁸ can form a ring comprising 4 to 8 atoms
optionally bearing substituents [wherein said moieties are defined in claims 9-15].

23. (Amended) The catalyst according to [any of claims 20-22]claim 20, wherein said alumoxane is selected from methylalumoxane (MAO), isobutylalumoxane (TIBAO) [and]or 2,4,4-trimethyl-pentylalumoxane (TIOAO).
24. (Amended) The catalyst according to [any of claims 20-22]claim 20, wherein the compound capable of forming a metallocene alkyl cation is a compound of formula D⁺E⁻, wherein D⁺ is a Brønsted acid, able to donate a proton and to react irreversibly with a substituent X of the metallocene of formula (I) and E⁻ is a compatible anion, which is able to stabilize the active catalytic species originating from the reaction of the two compounds, and which is sufficiently labile to be able to be removed by an olefinic monomer.
25. (Amended) A process for the preparation of a polymer of alpha-olefins comprising contacting one or more alpha-olefins under polymerization conditions with a catalyst obtained by contacting:

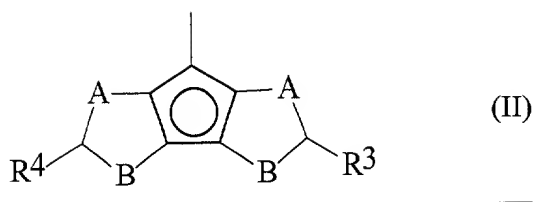
(A) a metallocene compound of formula (I)



wherein

L is a divalent group bridging the moieties G and Z, selected from CR¹R², SiR¹R² or (CR¹R²)₂, wherein R¹ and R², which may be the same as or different from each other, are
hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or
C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom, and can form a ring having 3 to 8
atoms optionally bearing a substituent;

Z is a moiety of formula (II):



wherein

R³ and R⁴, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom;

A and B are sulfur (S), oxygen (O) or CR⁵, wherein R⁵ is hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing a heteroatom with the proviso that if A is S or O, then B is CR⁵ or if B is S or O, then A is CR⁵, and wherein the rings containing A and B have a double bond in the allowed position;

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements,

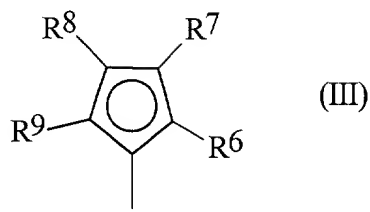
X, which may be the same or different, is a hydrogen atom, halogen atom, a group R¹⁰, OR¹⁰, OSO₂CF₃, OCOR¹⁰, SR¹⁰, NR¹⁰₂ or PR¹⁰₂, wherein the substituents R¹⁰ are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms;

p is an integer of from 1 to 3, being equal to the oxidation state of the metal M minus 2;

with the proviso that said metallocene compound is different from:

isopropylidene (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-trimethylsilylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-ethylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-ethylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-n-butylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-n-butylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-methylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, dimethylsilanediyl (3-methylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride, isopropylidene (3-isopropylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride and dimethylsilanediyl (3-isopropylcyclopentadienyl)(7-cyclopentadienyl)zirconium dichloride;

and G is a moiety of formula (III):



wherein R⁶, R⁷, R⁸ and R⁹, which may be the same as or different from each other, are hydrogen, a C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl, or C₇-C₂₀-arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, at least one of substituent pairs R⁶ and R⁷, and R⁸ and R⁹ can form a ring comprising from 3 to 8 atoms, optionally bearing substituents; with the proviso that R⁷ is different from R⁸ and when R⁷ is a tertbutyl radical R⁸ is not hydrogen; and

(B) at least one of an alumoxane and a compound capable of forming an alkyl metallocene[defined in any of claims 20-24].

26. The process according to claim 25 for the preparation of homo- and copolymers of propylene.
27. (Amended) The process according to claim 26 wherein the process is carried out in the presence of an alpha-olefin selected from 1-butene, 1-pentene, 1-hexene, 4-methyl-1-pentene, 1-octene, 1-decene [and]or 1-dodecene.
28. The process according to claim 25 for the preparation of homo- and copolymers of ethylene.
29. (Amended) The process according to claim 28, wherein the process is carried out in the presence of an olefin selected from propylene, 1-butene, 1-pentene, 4-methyl-1-pentene, 1-hexene, 1-octene, 4,6-dimethyl-1-heptene, 1-decene, 1-dodecene, 1-tetradecene, 1-hexadecene, 1-octadecene, 1-eicosene, allylcyclohexane, cyclopentene, cyclohexene and norbornene, 1,5-hexadiene, 1-6-heptadiene, 2-methyl-1,5-hexadiene, trans 1,4-hexadiene, cis 1,4-hexadiene, 6-methyl-1,5-heptadiene, 3,7-dimethyl-1,6-octadiene, 11-methyl-1,10-dodecadiene, or 5-ethylidene-2-norbornene .
30. (Amended) The process according to [any of claims 25-29]claim 25 wherein the catalyst is supported on an inert carrier.
31. (Amended) The process according to [any of claims 25-30]claim 25 characterized in that

it is carried out in gas phase.

32. (Amended) A propylene homopolymer having the following characteristics:
- triads (mm) satisfy the relation $55 < mm < 85$;
 - melting enthalpy (ΔH) of between 5 J/g and 70 J/g.
 - Haze (ASTM 2457) from 15% to 30%;
 - Gloss (60°C) (ASTM 2457) from 60% to 95%;
 - Tensile modulus (ASTM D4065) from 1000 [Mpa]MPa to 200 [Mpa]MPa;
 - Elongation at break (ASTM D4065) from 300% to 900%;
 - Strength at break (ASTM D638) from 10% to 40%.
33. A propylene copolymer containing from 0.1 to 30% by moles of units deriving from an olefin of formula $\text{CH}_2=\text{CHR}'$, R' being hydrogen, a $\text{C}_2\text{-C}_{20}$ -alkyl or a $\text{C}_6\text{-C}_{12}$ -aryl group, said propylene copolymer having the following characteristics:
- melting enthalpy < 70 J/g;
 - triads (mm) satisfy the relation: $30 < mm < 85$.
34. The propylene copolymer according to claim 33 wherein the olefin of formula $\text{CH}_2=\text{CHR}'$ is ethylene.